

ORIGINAL PAPERS

Dent. Med. Probl. 2009, 46, 1, 25–31
ISSN 1644-387X

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Models of Predicting the Co-Operation of Little Children Participating in the Programme Aimed at Their Adaptation to Dental Treatment

Modele prognozujące kooperację małego dziecka uczestniczącego w programie adaptacji do leczenia stomatologicznego

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Abstract

Background. The method of adaptation of up to three year old children to dental treatment is aimed at creating the conditions which are favourable to shaping their positive attitude to the medical procedures to which they are subjected. The programme participants were mothers and their children. While working with the mother-child dyad the dentist tries to locate them in such a manner that he is able to control the transfer of emotions in order to reinforce the flow of concern and reduce the flow of anxiety.

Objectives. The purpose of the research was to evaluate this method and, in particular, distinguish the factors which make it possible to forecast desirable behaviour.

Material and Methods. The study involved 33 mother-child dyads. The successive dental visits were videoed and analysed by psychologists with regard to the changes in each pair's behaviour. The components of the mothers' attitude such as their level of dental fear, apprehension of their children as well as their confidence in the dentist were measured and a number of demographic and medical variables were controlled. The application of regression analysis allowed to isolate the determiners of the patient's co-operative behaviour during his/her first, second and last dental appointment.

Results. The analysis revealed those moments of the successive visits which had the most important effect on the quality of the children patients' co-operation throughout all the visits. As a result, in the light of the obtained findings, the method proved to be efficient and the change in the mothers' attitude guaranteed its durability.

Conclusions. The programme of adaptation to dental treatment efficiently prepares children for developing their favourable attitude to it. The durability of the effects it provides is secured by the change in their mothers' attitude (*Dent. Med. Probl.* 2009, 46, 1, 25–31).

Key words: method of adaptation of young children to dental treatment, dental fear, co-operative behaviour, mother-child dyad.

Streszczenie

Wprowadzenie. Metoda adaptacji dzieci (do lat trzech) do leczenia dentyścycznego ma na celu stworzenie warunków kształtowania pozytywnej postawy. W programie uczestniczą matka i dziecko. Pracując z diadą matka-dziecko, lekarz tak sytuuje osoby, aby mieć kontrolę nad przepływem emocji – empatię troski wzmacniać, a blokować przepływ lęku. Dziecko siedzi w fotelu dentyścycznym na kolanach matki (tyłem), co zapewnia kontakt dotykowy, uniemożliwia natomiast kontakt wzrokowy. Dzięki temu lekarz, zwrócony twarzą do nich, kontroluje kanał spojrzenia i może, odzwierciedlając emocje pozytywne (bezpieczeństwo, aprobatę, zachętę), ignorować lub zmieniać emocje negatywne (lęk, zniecierpliwienie).

Cel pracy. Ewaluacja tej metody, a szczególnie wyodrębnienie czynników, które prognozują pożądane zachowania.

Materiał i metody. Badaniem objęto 33 diady matka-dziecko. Kolejne wizyty były nagrywane i analizowane przez psychologów ze względu na zmiany zachowania obojga uczestników. Mierzono również składniki postawy matki, jakimi były: poziom lęku dentyścycznego, obawa o dziecko i zaufanie do lekarza, a także kontrolowano wiele zmiennych demograficznych i medycznych. Za pomocą metody regresji krokowej wyodrębniono determinanty współpracujących zachowań pacjenta podczas pierwszej wizyty, drugiej wizyty i wizyty końcowej.

Wyniki. Analiza wskazała te elementy kolejnych wizyt, które w największym stopniu wyznaczały jakość współpracy podczas całej wizyty. Pokazała też, że zachowanie w czasie następnych wizyt jest uwarunkowane tym, co zdarzyło się podczas poprzednich. Najbardziej doniosłym wynikiem jest jednak wykrycie zależności między poziomem własnego lęku dentystycznego matki a gotowością do współpracy jej dziecka. Lęk ten zmniejszył się w rezultacie jej uczestnictwa w programie. Wyniki wskazują zatem na dużą skuteczność metody, a zmiana postawy matki gwarantuje jej trwałość.

Wnioski. Program adaptacji do leczenia stomatologicznego skutecznie przygotowuje dziecko do tego, aby w przyszłości miało pozytywną postawę do leczenia. Zabezpieczeniem trwałości skutków adaptacji jest zmiana postawy matki (*Dent. Med. Probl.* 2009, 46, 1, 25–31).

Słowa kluczowe: metoda adaptacji małych dzieci do leczenia dentystycznego, lęk dentystyczny, zachowanie współpracujące, diada matka–dziecko.

By the vast majority of our society a visit to the dental surgery is still considered to be the symbol of an unpleasant experience [1–3] and its expectations are permeated with fear. It makes people postpone a dental appointment until the dentist's intervention appears to be unavoidably painful, which, in turn, confirms such expectations and intensifies the dental anxiety. This is why, at least in the case of the youngest generation of patients, the formation of positive attitude towards dental treatment is such an important issue but not an easy one to solve. During their dental visits little children, who are still incapable of understanding the meaning of the event they are participating in, are likely to make their treatment difficult or even impossible. If they are left alone in the surgery they are affected by their separation fear (split-up with their carer). If he/she is accompanied by their mother, the dentist, in fact, works with both of them. Even against her mindful intention the mother emphatically passes on her attitude to dental procedures to her child.

The method of early adaptation [4] was meant for up to three years old children and their mothers to provide them with the experiences conducive to shaping their positive attitude to treatment in the future. The method includes a number of steps, which are used flexibly depending on the initial and present child's readiness to co-operate.

While working with the mother-child dyad the dentist tries to locate them in such a manner that he is able to control the transfer of emotions in order to reinforce the flow of concern and reduce the flow of anxiety. The mother sits on the dental chair with the child on her lap. The child, however, is turned back and, like his/her mother, faces the dentist. This is how the eye contact is blocked, whereas the tactile one is retained. Facing towards the chair, and both of them, the dentist is able to control the visual channel and can ignore or change their negative feelings (anxiety, impatience) through communicating positive emotions (safety, approval, encouragement). The tactile channel, which is less sensitive to the subtle alterations in the intensity of emotion transmission but is more

effective in passing on safety, plays the role of positive emotional background [5].

Desirable co-operative behaviours are displayed in a model form and their imitating is suggested. They are also reinforced with positive dentist's emotions (smile, tone of voice, gesture), which, in turn, makes the pattern of a model reaction for the mother. At first quite a large range of desirable behaviours, as well as the ones similar to them, are reinforced. Then reinforcements are applied more and more selectively to gradually obtain the expected one. Undesirable behaviours are extinguished through ignoring them or through their gradual desensitization (the mother's behaviour is modelled in the same way).

The exercises carried out at home (roleplaying a little tiger) are also an essential part of the method. Mothers are asked to 'teach' their children between subsequent visits to open their mouth on request, keep it open and approve of their upper lips being lifted. This everyday exercise introduces the behaviours promoted in the surgery to the dyad interactions. It clears the way for the child to acquire the pattern of desired reactions and enables the mother to directly influence her child. It also reduces her apprehension of transferring her control to someone else (i.e. to the dentist who she is afraid of herself). Time is a very important factor to determine the success of the method. One should not hurry to move on from one adaptation stage to another.

The study, a part of which is presented in this article, was aimed at the evaluation of the efficiency of the described method [4]. Its fragment chosen to be presented here deals with the factors which appeared to be the best predictors of the desirable co-operative children's behaviour in the course of their first and subsequent dental visits.

Material and Methods

The study involved 33 children on their first dental visits accompanied by their mothers. They were seen by the same dentist in an appropriately prepared dental surgery. After the mothers' consent

was obtained all successive appointments were videoed and then analysed by three independent experts (psychologists), who employed a number of elaborated categories for evaluating both the children's and their mothers' behaviour [4, 5]. The mothers' attitude towards dental treatment, their dental anxiety, apprehension about their children as well as their confidence in the dentist were measured before the first and after the last visit.

The research project was given consent (476/2006) by Bioethical Commission at the Wrocław Medical University.

As a result of a careful analysis 7 stages of the dental visit were distinguished 1) entering the surgery, 2) activities in the dental chair, 3) conversation with the child, 4) showing, 5) carrying out a procedure, 6) rewarding, 7) leaving the surgery). The children's behaviours during the particular stages of their visits were analysed and categorized as neutral, co-operative and impeding. The analysis also allowed to ascribe them the following numerical indexes: co-operative stage (CS) – 1 point, pre-cooperative stage (PS) – 0 points, impeding stage (IS) – -1 point. The total of score obtained by a child was a general index (the interval scale ranging from -7 to 7) of his/her behaviour throughout the appointment. The following generalized categories of the children's behaviour were distinguished: co-operative (from 7 to 4 points), pre-cooperative (from 3 to 0 points), pre-cooperative with impediments (from -1 to -3) and impeding (from -4 to -7).

Similarly, within the particular stages of the visits the number of neutral, co-operative and impeding behaviours were identified in the mothers, and they were scored as follows: neutral stage (NS) -1 point, co-operative stage (CS) – 0 points, impeding stage (IS) – -1 point. The total score (ranging from -7 to 7) made it possible to assess the mothers' behaviour as neutral (from 7 to 4), co-operative (from 3 to 0), passive (from -1 to -3) or impeding (from -4 to -7), [4, 6]. The cognitive-behavioural techniques (positive reinforcement, modelling, implosive technique, abreaction) as well as the factors disturbing the course of the visits (other children's cry, banging tools, other people in the surgery, video camera) were also analysed.

The mothers' own dental anxiety (DAS scale), their anxiety about their children (authors' modified version of DAS scale) and confidence in the dentist were recorded before the first and after the last visit [7-9]. Moreover, some socio-demographic (family structure, parents' education and occupation) and medical (general health state, previous children's medical experiences) data were collected too.

To identify the factors explaining the variability of the level of the children's co-operative

behaviour throughout the successive appointments an attempt was made to construct the relevant models using regression analysis [10]. The procedure was aimed at selecting from all the dependent variables the ones which made it possible to predict the changes of the independent variable (see Table1).

Results and Discussion

The Model for Predicting Co-Operative Behaviour During the First Visit

The predictors which were the most closely correlated with the independent variable (children's co-operative behaviour during their first visit) were chosen among all the predictors significantly correlated with it (see Table 1 and 2). The children's' behaviour during the fifth stage (carrying out a procedure) was found to be the best predictor of the model (Beta = 0.83), which indicates that the behaviour during this key stage of the visit was the best reflection of the children's readiness to undergo the procedures, and this is where the greatest deal of concern over winning the child's co-operation should be focused on. However, this variable is also the one whose values contributes to the value of the criterion (explained) variable, which should be taken into account to interpret it. Therefore other factors like 'the level of the mothers' confidence in the dentist' (Beta = -0.28) and their own 'level of dental anxiety' (Beta = 0.15) should be considered the real external predictor of the co-operative behaviour. Their importance was also attested by the significant partial and semipartial correlations.

Because the value of the coefficient of determination was as high as $R^2 = 0.80$, the combined predictive effect of these variables turned out to be of the high statistical significance ($p < 0.000001$). The presented model explains 80% of the variability of the children's co-operation category and can be considered a good one, which is additionally supported by the high multiple correlation coefficient ($R = 0.90$).

The Model for Predicting Co-Operative Behaviour During the Second Visit

The following predictors of the 'children's behaviour during their second visit' variable were chosen for the multiple regression equation: 'co-operative behaviours during their first visit', the

Table 1. The predictors of the children's behaviour during their successive dental visits**Tabela 1.** Zmienne prognostyczne wpływające na zachowanie dziecka podczas wizyt

Independent variables (Zmienne wartości)	Predictors (Zmienne prognostyczne)	r	Level of significance (Poziom istotności) p
Co-operative behaviours during the first visit (Zachowania współpracujące dziecka podczas I wizyty)	child's co-operative behaviour in stage 1. entering surgery	0.57	***
	child's co-operative behaviour in stage 2. sitting on dental chair	0.83	***
	child's co-operative behaviour in stage 3. conversation	0.83	***
	child's co-operative behaviour in stage 4. showing	0.84	***
	child's co-operative behaviour in stage 5. procedure	0.87	***
	child's co-operative behaviour in stage 6. rewarding	0.77	***
	child's co-operative behaviour in stage 7. leaving surgery	0.76	***
	pws during stage 5. procedure	0.52	***
	modelling during stage 5. procedure	-0.27	t
	pvr during stage 7. leaving surgery	0.43	*
	sound of crying during stage 1. entering surgery	-0.54	***
	does not want to sit on dental chair	-0.46	***
	is sitting with mother on dental chair	-0.37	*
	low level of mother's apprehension about child	0.45	***
	low level of mother's confidence in dentist	0.27	t
medium level of mother's apprehension about child	-0.44	*	
Co-operative behaviours during the second visit (Zachowanie współpracujące dziecka podczas II wizyty)	child's behaviour in stage 2. sitting on dental chair during I visit	0.69	***
	co-operative attitude during I visit	0.79	***
	child's co-operative behaviour in stage 2. sitting on dental chair	0.67	***
	child's co-operative behaviour in stage 3. conversation	0.81	***
	child's behaviour in stage 4. showing	0.80	***
	child's behaviour in stage 5. procedure	0.69	***
	child's behaviour in stage 6. rewarding	0.80	***
	child's behaviour in stage 7. leaving surgery	0.71	***
	pvr during stage 2 sitting on dental chair	0.46	***
	pws during stage 5. procedure	0.40	*
	child sitting alone on dental chair	0.67	***
	child sitting with mother on dental chair	-0.54	***
	child's unpleasant medical experiences	-0.36	*
	contact with peers	0.24	t
	high level of mother's dental care (DAS)	0.30	*
medium level of mother's dental care (DAS)	-0.27	t	
Co-operative behaviours during the final visit Zachowanie współpracujące dziecka podczas wizyty końcowej	child's co-operative behaviour in stage 3. conversation	0.49	***
	child's co-operative behaviour in stage 5. procedure	0.49	***
	child's co-operative behaviour in stage 7. leaving surgery	0.74	***
	pws during stage 5. procedure	0.41	*
	other people during stage 1 entering surgery	-0.49	***
	child sitting alone on dental chair	0.40	*
	child sitting with mother on dental chair	-0.27	t
	t (tendency) 0.05 < p < 0.1; *p < 0.05; ***p < 0.001		

pvr – positive verbal reinforcement.
r – Pearson's correlation coefficients.

pws – pozytywne wzmocnienie słowne.
r – współczynnik korelacji Pearsona.

Table 2. The models of predicting children's co-operative behaviour during successive visits**Tabela 2.** Modele prognozujące zachowanie współpracujące u dziecka podczas kolejnych wizyt

Model predicting child's co-operative behaviour during I visit (Model prognozujący współpracujące zachowanie dziecka podczas I wizyty)				
	Beta	B	Level of significance	
Level of mother's dental anxiety (DAS)	0.15	0.15	0.05	
Level of mother's confidence in dentist (DBS)	-0.28	-0.08	0.001	
Child's co-operative behaviour in stage 5. procedure	0.83	4.25	0.001	
Partial and semipartial correlations among studied variables				
	Beta	Partial correlation coefficient	Semipartial correlation coefficient	Level of significance
Level of mother's dental anxiety (DAS)	0.15	0.30	0.13	0.05
Level of mother's confidence in dentist (DBS)	-0.28	-0.52	-0.26	0.001
Child's co-operative behaviour in stage 5. procedure	0.83	0.88	0.80	0.001
Model predicting child's co-operative behaviour during II visit (Model prognozujący współpracujące zachowanie dziecka podczas II wizyty)				
	Beta	B	Level of significance	
Level of mother's dental anxiety (DAS) study I	0.21	0.18	0.06	
Child's co-operative attitude during visit I	0.70	0.58	0.001	
Partial and semipartial correlations among studied variables				
	Beta	Partial correlation coefficient	Semipartial correlation coefficient	Level of significance
Level of mother's dental anxiety (DAS) study I	0.21	0.34	0.21	0.06
Child's co-operative attitude during visit I	0.70	0.77	0.71	0.001
Model predicting child's co-operative behaviour during final visit (Model prognozujący współpracujące zachowanie dziecka podczas końcowej wizyty)				
	Beta	B	Level of significance	
Modelling during stage 5. procedure visit I	-0.25	-0.19	0.001	
Child's co-operative behaviour in stage 3. conversation – final visit	0.45	1.62	0.001	
Child's co-operative behaviour in stage 7. leaving surgery – final visit	0.72	1.35	0.001	
Partial and semipartial correlations among studied variables				
	Beta	Partial correlation coefficient	Semipartial correlation coefficient	Level of significance
Modelling during stage 5. procedure visit I	-0.25	-0.52	-0.26	0.001
Child's co-operative behaviour in stage 3. conversation – final visit	0.45	0.74	0.47	0.001
Child's co-operative behaviour in stage 7. leaving surgery – final visit	0.72	0.87	0.75	0.001

mothers' dental anxiety' and 'co-operative behaviours during the sixth stage (rewarding) of the second visit' (see Table 1 and 2).

'The co-operative children's behaviour during their first visit' was most closely correlated with the independent variable ($r = 0.79$) and, at the

same time, with 23 other dependent variables. The value of the isolated effect of both variables (coefficient of semipartial correlation) was 0.71. Thus, the experience acquired from the first contact with the dentist (the first stage of adaptation) proved to have the strongest effect on the quality of the co-

operation in the course of the second visit, which indicates the consistency of the method as well as the steady progress of the adaptation process. The sixth stage of the second visit (rewarding), where the index of co-operation level turned out to be most closely related to the behaviour during the first visit ($r = 0.63$), proved to be a key one though it revealed significantly fewer relations to other variables.

The Model for Predicting Co-Operative Behaviour During the Final Visit

The model presented in Table 2 proved to be the most adequate. It shows that the following factors were the most important to 'the children's co-operative behaviour during the final visit' variable: 'the children's co-operative behaviour during the seventh stage (leaving the surgery) of the final visit', 'the children's co-operative behaviour during the third stage (conversation with the child) of the final visit' and 'the employment of modelling technique during the fifth stage (carrying out a procedure) of the first visit'. The last variable was negatively correlated and contributed relatively weak to obtaining 'the co-operative behaviour during the final visit'. The category called 'the child's co-operative behaviour' is, to a very high degree of significance ($p < 0.000001$), in 80% determined by this model ($R^2 = 0.80$; $R = 0.90$ combined for all the variables).

As it can be concluded from the models of prediction of the children's behaviour presented in Table 2, the mother's fear appeared to be the most essential factor, which was external to the very adaptation method used by the dentist. It played a decisive role in predicting the behaviour during the first and second visit. It lost its significance in the course of the final visit, where the level of co-operation was explained by the very properties of the interactions in the surgery. The decrease in the importance of the mothers' dental anxiety was

probably due to its lowered intensity. Its higher level was revealed at its initial measurement compared with the final one. At first the high level of anxiety was identified in nearly 50% of the mothers (medium in 36% and low in 15% of them), whereas after the adaptation programme was completed the high anxiety was displayed by only 15% of the mothers (medium by 54% and low by 30%). The differences proved to be statistically significant ($\chi^2 = 8.63$; $p < 0.05$). The weakening of the anxiety resulted from the applied adaptation procedure, being at the same time the important part of the mechanism which changed the children's behaviour.

A little child and his/her mother make a very durable social set characterised by some stable parameters, the stability of which is sustained by homeostatic feedback loops [11]. They delineate the patterns of interactions where the mother's expectations are fulfilled [12]. The interaction with a little child takes place mostly at emotional level. The mother's and child's feelings attune to one another and are transferred between them empathetically. The mother who is afraid of the dentist will pass her fear on her child even against her will. This is why not only a little patient but the mother-child dyad should be involved in any adaptation procedure. As it turned out, the benefits coming from the participation in the programme were not restricted to changes in the children's behaviour. They were substantially amplified by the adults' attendance. The mothers' whose attitude had been shaped by their numerous own experiences, observed the development of their children co-operation and actively took part in its stimulation, modified their own attitude and reduced their own dental anxiety. As it can be seen, apart from the medical consultation itself, good co-operation with a little child is substantially influenced by his/her mother's emotional behaviour.

In conclusion, the programme of early adaptation to dental treatment efficiently prepares children for developing their favourable attitude to it. The durability of the effects it provides is secured by the change in their mothers' attitude.

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Received: 30.03.2009

Revised: 28.04.2009

Accepted: 28.04.2009

Praca wpłynęła do Redakcji: 30.03.2009 r.

Po recenzji: 28.04.2009 r.

Zaakceptowano do druku: 28.04.2009 r.

LISTA FILADELFIJSKA CZASOPISM STOMATOLOGICZNYCH ZA 2007 R.
Część pierwsza – czasopisma ogólnostomatologiczne (20 tytułów IF: 0,5–3,496)

Nazwa tytułu	Skrót	Kraj wydawcy	Częstotliwość ukazywania się w roku	IF
Journal of Dental Research	J. Dent. Res.	USA	12	3,496
Dental Materials	Dent. Mater.	W. Brytania	6	2,99
Swedisch Dental Journal	Swed. Dent. J.	Szwecja	4	2,109
European Journal of Oral Sciences	Eur. J. Oral Sci.	Szwecja	6	2,071
Community Dentistry and Oral Epidemiology	Commun. Dent. Oral Epidemiol.	W. Brytania	6	2,039
Journal of Dentistry	J. Dent.	W. Brytania	12	1,995
Clinical Oral Investigations*	Clin. Oral Invest.	Niemcy	4	1,956
Oral Microbiology and Immunology	Oral Microbiol. Immunol.	USA	6	1,854
Journal of Orofacial Pain	J. Orofac. Pain	Kanada	4	1,825
Journal of the American Dental Association	JADA	USA	12	1,698
American Journal of Dentistry	Am. J. Dent.	USA	6	1,276
International Journal of Periodontics & Restorative Dentistry	Int. J. Periodontisc Restorative Dent.	USA	6	1,27
Acta Odontologica Scandinavica	Acta Odontol. Scand.	Szwecja	6	1,112
Dental Traumatology	Dent. Traumatol.	USA	6	1,093
British Dental Journal	Brit. Dent. J.	W. Brytania	24	1,018
Journal of Public Health Dentistry	J. Public. Health Dent.	USA	4	0,775
International Dental Journal	Int. Dent. J.	W. Brytania	6	0,759
Community Dental Health*	Commun. Dent. Health	Irlandia	4	0,736
Quintessence International	Quintessence Int.	USA	10	0,728
Australian Dental Journal	Aust. J. Dent.	Australia	4	0,5

* Czasopisma weszły na Listę w 2007 roku.